

CLAIMS

1. A separator comprising a microporous layer, wherein said separator is prepared according to a method comprising the steps of:
  - 5 (a) coating a microporous layer on a temporary carrier substrate to form a microporous layer assembly, wherein said microporous layer has a first surface in contact with said temporary carrier substrate and has a second surface on the side opposite from said temporary carrier substrate;
  - (b) coating an overlying layer on said second surface of said microporous layer,  
10 wherein said overlying layer has a first surface in contact with said second surface of said microporous layer and has a second surface on the side opposite from said microporous layer; and
  - (c) removing said temporary carrier substrate from said first surface of said microporous layer to form said separator;
- 15        wherein said microporous layer comprises one or more microporous xerogel layers and wherein at least one of the one or more microporous xerogel layers comprises a zirconium oxide xerogel material.
2. The separator of claim 1, wherein said microporous layer further comprises an  
20 organic polymer binder.
3. The separator of claim 2, wherein said organic polymer binder is a polyvinyl alcohol.
4. The separator of claim 2, wherein said microporous layer further comprises a  
25 plasticizer component.
5. The separator of claim 1, wherein the thickness of said separator is from 1 to 25 microns.

6. The separator of claim 1, wherein the thickness of said separator is from 5 to 15 microns.
7. A separator for use in an electrochemical cell, wherein said separator comprises a microporous xerogel layer, which xerogel layer comprises zirconium oxide.
8. The separator of claim 7, wherein said microporous layer further comprises an organic polymer binder.
9. The separator of claim 8, wherein said organic binder is polyvinyl alcohol.
10. The separator of claim 8, wherein said microporous layer further comprises a plasticizer component.
11. The separator of claim 7, wherein the thickness of said separator is from 1 to 25 microns.
12. The separator of claim 7, wherein the thickness of said separator is from 5 to 15 microns.
13. An electrochemical cell comprising a cathode, an anode and a separator comprising a microporous layer interposed between said cathode and said anode, wherein said separator is prepared according to a method comprising the steps of:
  - (a) coating a microporous layer on a temporary carrier substrate to form a microporous layer assembly, wherein said microporous layer has a first surface in contact with said temporary carrier substrate and has a second surface on the side opposite from said temporary carrier substrate;
  - (b) coating an overlying layer on said second surface of said microporous layer, wherein said overlying layer has a first surface in contact with said second surface of said microporous layer and has a second surface on the side opposite from said microporous layer; and

(c) removing said temporary carrier substrate from said first surface of said microporous layer to form said separator;

wherein said microporous layer comprises one or more microporous xerogel layers and wherein at least one of the one or more microporous xerogel layers comprises a zirconium oxide xerogel material.

14. The cell of claim 13, wherein said microporous layer further comprises an organic polymer binder.

10 15. The cell of claim 14, wherein said organic polymer binder is a polyvinyl alcohol.

16. The cell of claim 14, wherein said microporous layer further comprises a plasticizer component.

15 17. The cell of claim 13, wherein said cell is a secondary electrochemical cell.

18. The cell of claim 13, wherein said cell is a primary electrochemical cell.

19. An electrochemical cell comprising a cathode, an anode, and a separator interposed between said cathode and said anode, wherein said separator comprises a microporous xerogel layer, which xerogel layer comprises zirconium oxide.

20 20. The cell of claim 19, wherein said microporous layer further comprises an organic polymer binder.

25

21. The cell of claim 20, wherein said organic polymer binder is a polyvinyl alcohol.

22. The cell of claim 20, wherein said microporous layer further comprises a plasticizer component.

30

23. The cell of claim 19, wherein said cell is a secondary electrochemical cell.

24. The cell of claim 19, wherein said cell is a primary electrochemical cell.

5

10

15

20

25

30